COMPARISON OF CROSS-GRID METHOD AND ACCOMMODATION-RESERVE METHOD FOR PRESBYOPIC CORRECTION

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Abstract:

A study of fifty presbyopic subjects was performed to compare the reading addition determined by using the Binocular Cross Cylinder (B.C.C.) method and the Accommodation-Reserve method. Seventy per cent of the subjects accepted a higher addition by +0.25 to +0.75 D with the Accommodation-Reserve method in which one half of the amplitude of accommodation was kept in reserve. Eighteen per cent accepted +0.25 to +0.75 D less plus with the Accommodation-Reserve method and twelve per cent of the subjects accepted the same add by both methods.

Introduction:

This study compared the reading additions obtained using the Binocular Cross Cylinder (Grosvenor, 1982; Reading, 1988) and the Accommodation-Reserve method (Reading, 1988). Various studies have been conducted to determine the best method for prescribing the near addition. Goldberg (1976) has studied the development and use of a variable color, near point grid for determining the addition and found that this test seemed to minimize any tendency towards over-correction at near. Woo and Sivak (1979) compared the use of cross grid, a variable color grid and a near reading card on ten subjects and all three methods gave similar results.

Westheimer (1958) suggested that when using the cross grid test the patient should be asked to first observe the grid without the cross cylinder and report immediately whether the horizontal or the vertical lines appear sharper. If the horizontal lines appear clearer, a low positive sphere may be added and the procedure

repeated until both of the meridians of the grid seem equally clear on introduction of the cross cylinder. This method may also be used as a check for the distance correction.

Morgan suggested that when the cross grid test is performed monocularly, plus lenses should be added until the vertical lines become clearer than the horizontal lines. Plus lenses should then be reduced until the horizontal lines become just clear again.

Method:

In this study we compared the reading additions found using the Binocular Cross Cylinder (B.C.C.) with those found using the Accommodation-Reserve method. The study included male subjects in the age range of forty-one to sixty years old. Monocular subjects, diabetics, high ametropes, anisometropes and subjects with ocular pathology were excluded from the study. Subjects were required to have a corrected visual acuity of 20/25 and 0.5M at 40 cm or better.

Accommodation-Reserve Method

With the subject wearing the full distance correction and a tentative addition where necessary, the near point of accommodation was measured binocularly using a ruler. The amplitude of accommodation was calculated from this measurement. The habitual reading position was established and the near addition was calculated keeping 1/2 of the available accommodation in reserve. The following formula was used:

$$\textit{Near addition(D)} = \textit{Working distance(D)} - 1/2\ \textit{Amplitude of accommodation(D)}$$

The calculated addition was demonstrated in a trial frame to the subject in attempt to view 0.5M or better.

Cross-Grid Method

The cross-grid target consists of a cross made up of multiple black horizontal and vertical lines and is used in conjunction with a ±0.50 D cross-cylinder placed with its minus axis vertical. The starting point for this test was the distance correction providing the best visual acuity. The test was performed under low illumination (Borish, 1970) and was conducted binocularly. An illuminance of 10 lux (Woo and Long, 1979) has been suggested to avoid an increase in depth of focus and a possible perceptive change in target color.

The cross-grid target was presented to the subject at the habitual working distance. The subject was asked to report which set of lines, vertical or horizontal, appeared blacker relative to the other. The expected initial response was the horizontal lines appear blacker. Spheres in +0.25DS steps were then added binocularly until the subject first reported that the vertical lines were blacker. A -0.25 DS was then added binocularly to obtain a reversal in response. The reversal of response confirmed the end-point. The addition determined was demonstrated to the subject in attempt to view 0.5M or better.

The clinical importance of the B.C.C. is that it is relatively free from accommodation due to the Jackson Cross Cylinder (J.C.C.) which creates two dissimilar focal lines preventing any attempt to accommodate. When performed monocularly, the cross-cylinder method could also be used to check the distance correction.

Results and Discussion

Table 1 shows the difference between the additions found using the Binocular-Cross Cylinder method and the Accommodation-Reserve method.

TABLE 1

Method Used	No. of subjects accepting less plus using B.C.C. method			No. of subjects accepting more plus using B.C.C. method				**Total**
Difference (D)	-0.75	-0.50	-0.25	0.00	+0.25	+0.50	+0.75	
1/2 in Reserve	0	3	6	6	19	10	6	**50**
% of Total	0%	6%	12%	12%	38%	20%	12%	**100%**

Comparing the additions determined by the two methods, it was found that 70% of the subjects accepted a higher addition by +0.25D to +0.75D with the Accommodation-Reserve method. 12% of the subjects accepted the same addition using both methods. 18% of the subjects accepted a lower addition by +0.25D to +0.75D with the Accommodation-Reserve method. The results indicate that the Binocular Cross Cylinder method yields a lower addition for the same working distance.

This study has attempted to provide the clinician with the knowledge of how two widely used methods for determining near additions compare. The lowest reading addition which gives the subject comfort is desirable as it provides the maximum reading range and delays the need for trifocals. However, there is a tendency for subjects to accept a higher addition for a given distance. Based on the phoria status, description of the near task and habitual working distance, the clinician can then choose the method for determining the addition appropriately.

References

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